

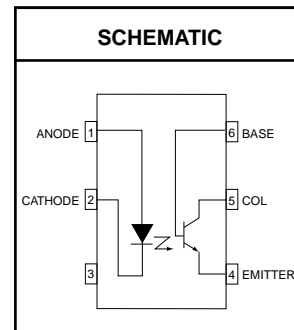
### DESCRIPTION

The CNY17 series consists of a Gallium Arsenide IRED coupled with an NPN phototransistor.

|                |                |
|----------------|----------------|
| <b>CNY17-1</b> | <b>CNY17-3</b> |
| <b>CNY17-2</b> | <b>CNY17-4</b> |

### FEATURES

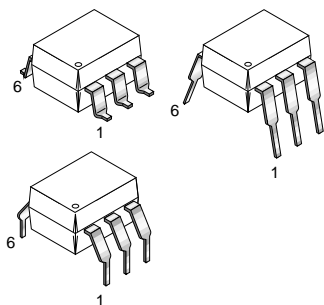
- CNY17-1/2/3 are also available in white package by specifying -M suffix (eg. CNY17-2-M)
- UL recognized (File # E90700)
- VDE recognized
  - 102497 for white package      -Add option V for white package (e.g., CNY17-2V-M)
  - File #102497                      -Add option '300' for black package (e.g., CNY17-2.300)
  - File #94766
- Current transfer ratio in select groups
- High  $BV_{CEO}$ —70V minimum



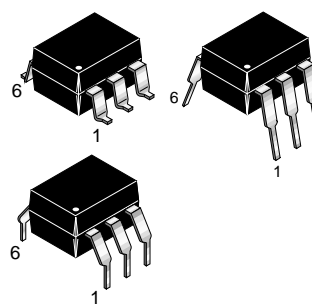
### APPLICATIONS

- Power supply regulators
- Microprocessor inputs
- Industrial controls
- Digital logic inputs
- Appliance sensor systems

#### WHITE PACKAGE (-M SUFFIX)



#### BLACK PACKAGE (NO -M SUFFIX)



| Parameters  | Symbol    | Device | Value          | Units |
|---|-----------|--------|----------------|-------|
| <b>TOTAL DEVICE</b>                                       |           |        |                |       |
| Storage Temperature                                       | $T_{STG}$ | All    | -55 to +150    | °C    |
| Operating Temperature                                     | $T_{OPR}$ | All    | -55 to +100    | °C    |
| Lead Solder Temperature                                   | $T_{SOL}$ | All    | 260 for 10 sec | °C    |
| Total Device Power Dissipation @ 25°C (LED plus detector) | $P_D$     | -M     | 250            | mW    |
| Derate Linearly From 25°C                                 |           | non -M | 260            |       |
|   |           | -M     | 2.94           | mW/°C |
|   |           | non -M | 3.50           |       |
| <b>EMITTER</b>  |           |        |                |       |
| Continuous Forward Current                                | $I_F$     | -M     | 60             | mA    |
| Reverse Voltage   | $V_R$     | All    | 6              |       |
| Forward Current - Peak (1 $\mu$ s pulse, 300 pps)         | $I_F(pk)$ | -M     | 1.5            | A     |
|   |           | non -M | 3.0            |       |
| LED Power Dissipation 25°C Ambient                        | $P_D$     | -M     | 120            | mW    |
| Derate Linearly From 25°C                                 |           | non -M | 135            |       |
|   |           | -M     | 1.41           | mW/°C |
|   |           | non -M | 1.8            |       |
| <b>DETECTOR</b>   |           |        |                |       |
| Detector Power Dissipation @ 25°C                         | $P_D$     | -M     | 150            | mW    |
| Derate Linearly from 25°C                                 |           | non -M | 200            |       |
|   |           | -M     | 1.76           | mW/°C |
|   |           | non -M | 2.67           |       |

**CNY17-1 CNY17-3**  
**CNY17-2 CNY17-4**

**ELECTRICAL CHARACTERISTICS** ( $T_A = 25^\circ\text{C}$  Unless otherwise specified.)

**INDIVIDUAL COMPONENT CHARACTERISTICS**

| Parameters                                | Test Conditions                          | Symbol     | Device | Min | Typ   | Max  | Units         |
|---|--|------------|--------|-----|-------|------|---------------|
| <b>EMITTER</b><br>Input Forward Voltage   | $I_F = 60 \text{ mA}$                    | $V_F$      | -M     |     | 1.35  | 1.65 | V             |
|   | $I_F = 10 \text{ mA}$                    |            | non -M |     | 1.15  | 1.50 |               |
| Capacitance                               | $V_F = 0 \text{ V}, f = 1.0 \text{ MHz}$ | $C_J$      | non -M |     | 50    |      | pF            |
|   |  |            | -M     |     | 18    |      |               |
| Reverse Leakage Current                   | $V_R = 6 \text{ V}$                      | $I_R$      | All    |     | 0.001 | 10   | $\mu\text{A}$ |
| <b>DETECTOR</b>                           |  |            |        |     |       |      |               |
| Breakdown Voltage<br>Collector to Emitter | $I_C = 1.0 \text{ mA}, I_F = 0$          | $BV_{CEO}$ | All    | 70  | 100   |      | V             |
| Collector to Base                         | $I_C = 10 \mu\text{A}, I_F = 0$          | $BV_{CBO}$ | All    | 70  | 120   |      | V             |
| Emitter to Collector                      | $I_E = 100 \mu\text{A}, I_F = 0$         | $BV_{ECO}$ | All    | 7   | 10    |      | V             |
| Leakage Current<br>Collector to Emitter   | $V_{CE} = 10 \text{ V}, I_F = 0$         | $I_{CEO}$  | All    |     | 1     | 50   | nA            |
| Collector to Base                         | $V_{CB} = 10 \text{ V}, I_F = 0$         | $I_{CBO}$  | All    |     |       | 20   | nA            |
| Capacitance<br>Collector to Emitter       | $V_{CE} = 0, f = 1 \text{ MHz}$          | $C_{CE}$   | All    |     | 8     |      | pF            |
| Collector to Base                         | $V_{CB} = 0, f = 1 \text{ MHz}$          | $C_{CB}$   | All    |     | 20    |      | pF            |
| Emitter to Base                           | $V_{EB} = 0, f = 1 \text{ MHz}$          | $C_{EB}$   | All    |     | 10    |      | pF            |

**ISOLATION CHARACTERISTICS**

| Characteristic                 | Test Conditions                          | Symbol    | Device             | Min       | Typ** | Max | Units     |
|--------------------------------|--|-----------|--------------------|-----------|-------|-----|-----------|
| Input-Output Isolation Voltage | $f = 60 \text{ Hz}, t = 1 \text{ min.}$  | $V_{ISO}$ | Black Package      | 5300      |       |     | Vac(rms)* |
|                                |  |           | '-M' White Package | 7500      |       |     | Vac(pk)   |
| Isolation Resistance           | $V_{I-O} = 500 \text{ VDC}$              | $R_{ISO}$ | All                | $10^{11}$ |       |     | $\Omega$  |
| Isolation Capacitance          | $V_{I-O} = \emptyset, f = 1 \text{ MHz}$ | $C_{ISO}$ | Black Package      |           | 0.5   |     | pF        |
|                                |  |           | '-M' White Package |           | 0.2   |     |           |

Note

\* 5300 Vac(rms) for 1 minute equates to approximately 9000 Vac (pk) for 1 second

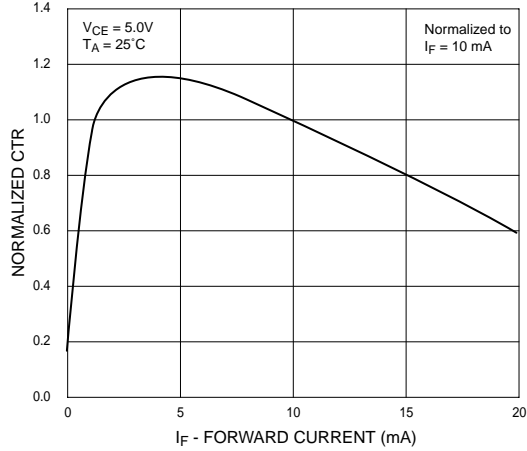
\*\* Typical values at  $T_A = 25^\circ\text{C}$

**CNY17-1 CNY17-3**  
**CNY17-2 CNY17-4**

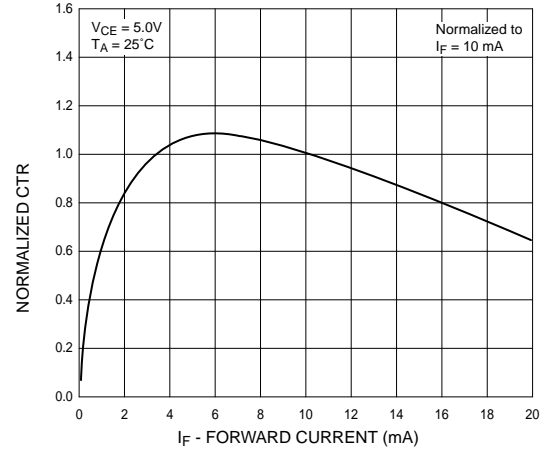
| <b>TRANSFER CHARACTERISTICS</b> ( $T_A = 25^\circ\text{C}$ Unless otherwise specified.) |   |   |                              |            |            |               |               |               |
|---|---|---|------------------------------|------------|------------|---------------|---------------|---------------|
| <b>DC Characteristics</b>   | <b>Test Conditions</b>  | <b>Symbol</b>   | <b>Device</b>                | <b>Min</b> | <b>Typ</b> | <b>Max</b>    | <b>Units</b>  |               |
| Current Transfer Ratio,<br>Collector to Emitter   | $I_F = 10\text{ mA}, V_{CE} = 5\text{ V}$                         | CTR   | CNY17-1/-1-M                 | 40         |            | 80            | %             |               |
|   |   |   | CNY17-2/-2-M                 | 63         |            | 125           |               |               |
|   |   |   | CNY17-3/-3-M                 | 100        |            | 200           |               |               |
|   |   |   | CNY17-4                      | 160        |            | 320           |               |               |
| Saturation Voltage  | $I_F = 10\text{ mA}, I_C = 2.5\text{ mA}$                         | $V_{CE(SAT)}$   | All                          |            |            | .40           | V             |               |
| <b>AC Characteristics</b>   | <b>Test Conditions</b>  | <b>Symbol</b>   | <b>Device</b>                | <b>Min</b> | <b>Typ</b> | <b>Max</b>    | <b>Units</b>  |               |
| <b>Non-Saturated Switching Times</b>  | $R_L = 100\ \Omega, I_C = 2\text{ mA}, V_{CC} = 10\text{ V}$      | $t_{on}$  | non -M                       |            |            | 10            | $\mu\text{s}$ |               |
| Turn-On Time (Fig.19 and Fig.20)  |   |   |                              |            |            |               |               |               |
| Turn-Off Time (Fig.19 and Fig.20)   |   | non -M  |                              |            | 10         | $\mu\text{s}$ |               |               |
| Delay Time (Fig.19 and Fig.20)  |   | $I_F = 10\text{ mA}, V_{CC} = 5\text{ V}, R_L = 75\ \Omega$ | $t_d$                        | -M         |            |               | 5.6           | $\mu\text{s}$ |
| Rise Time (Fig.19 and Fig.20)   |   | $I_F = 10\text{ mA}, V_{CC} = 5\text{ V}, R_L = 75\ \Omega$ | $t_r$                        | -M         |            |               | 4.0           | $\mu\text{s}$ |
| Storage Time (Fig.19 and Fig.20)  |   | $I_F = 10\text{ mA}, V_{CC} = 5\text{ V}, R_L = 75\ \Omega$ | $t_s$                        | -M         |            |               | 4.1           | $\mu\text{s}$ |
| Fall Time (Fig.19 and Fig.20)   |   | $I_F = 10\text{ mA}, V_{CC} = 5\text{ V}, R_L = 75\ \Omega$ | $t_f$                        | -M         |            |               | 3.5           | $\mu\text{s}$ |
| <b>Saturated Switching Times</b>  | $I_F = 20\text{ mA}, V_{CE} = 0.4\text{ V}$                       | $t_{on}$  | CNY17-1                      |            |            | 5.5           | $\mu\text{s}$ |               |
| Turn-On Time (Fig.19 and Fig.20)  | $I_F = 10\text{ mA}, V_{CE} = 0.4\text{ V}$                       |   | CNY17-2, CNY17-3,<br>CNY17-4 |            |            | 8.0           |               |               |
| Rise-Time (Fig.19 and Fig.20)   | $I_F = 20\text{ mA}, V_{CE} = 0.4\text{ V}$                       | $t_r$   | CNY17-1                      |            |            | 4.0           | $\mu\text{s}$ |               |
|   | $I_F = 10\text{ mA}, V_{CE} = 0.4\text{ V}$                       |   | CNY17-2, CNY17-3,<br>CNY17-4 |            |            | 6.0           |               |               |
|   | $I_F = 20\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1\text{ K}\Omega$ |   | CNY17-1-M                    |            |            | 4.0           |               |               |
|   | $I_F = 10\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1\text{ K}\Omega$ |   | CNY17-2-M, CNY17-3-M         |            |            | 6.0           |               |               |
| Delay Time (Fig.19 and Fig.20)  | $I_F = 20\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1\text{ K}\Omega$ | $t_d$   | CNY17-1-M                    |            |            | 5.5           | $\mu\text{s}$ |               |
|   | $I_F = 10\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1\text{ K}\Omega$ |   | CNY17-2, CNY17-3             |            |            | 8.0           |               |               |
| Turn-Off Time (Fig.19 and Fig.20)   | $I_F = 20\text{ mA}, V_{CE} = 0.4\text{ V}$                       | $t_{off}$   | CNY17-1                      |            |            | 34.0          | $\mu\text{s}$ |               |
|   | $I_F = 10\text{ mA}, V_{CE} = 0.4\text{ V}$                       |   | CNY17-2, CNY17-3,<br>CNY17-4 |            |            | 39.0          |               |               |
| Fall-Time (Fig.19 and Fig.20)   | $I_F = 20\text{ mA}, V_{CE} = 0.4\text{ V}$                       | $t_f$   | CNY17-1                      |            |            | 20.0          | $\mu\text{s}$ |               |
|   | $I_F = 10\text{ mA}, V_{CE} = 0.4\text{ V}$                       |   | CNY17-2, CNY17-3,<br>CNY17-4 |            |            | 24.0          |               |               |
|   | $I_F = 20\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1\text{ K}\Omega$ |   | CNY17-1-M                    |            |            | 20.0          |               |               |
|   | $I_F = 10\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1\text{ K}\Omega$ |   | CNY17-2-M, CNY17-3-M         |            |            | 24.0          |               |               |
| Storage Time (Fig.19 and Fig.20)  | $I_F = 20\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1\text{ K}\Omega$ | $t_s$   | CNY17-1-M                    |            |            | 34.0          | $\mu\text{s}$ |               |
|   | $I_F = 10\text{ mA}, V_{CC} = 5\text{ V}, R_L = 1\text{ K}\Omega$ |   | CNY17-2-M, CNY17-3-M         |            |            | 39.0          |               |               |

**CNY17-1 CNY17-3**  
**CNY17-2 CNY17-4**

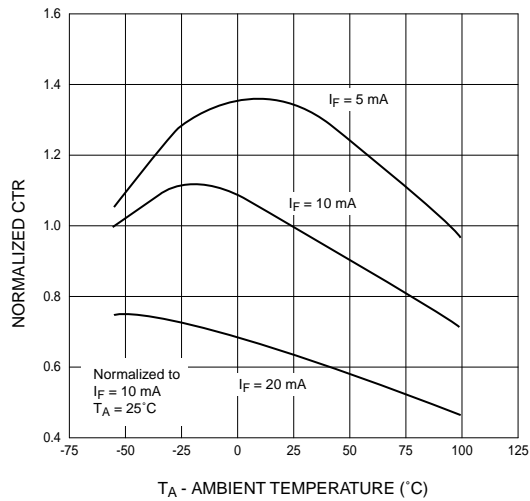
**Fig.1 Normalized CTR vs. Forward Current (Black Package)**



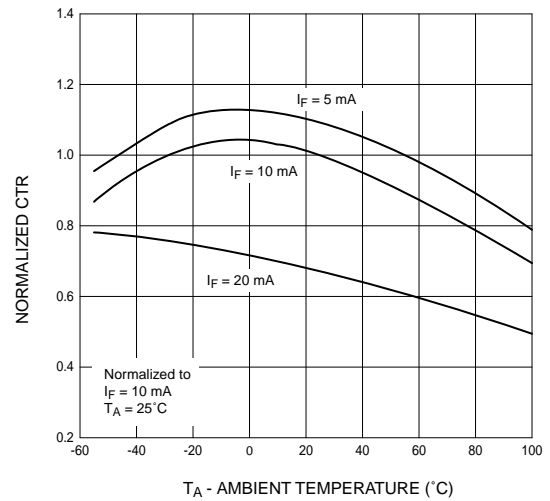
**Fig.2 Normalized CTR vs. Forward Current (White Package)**



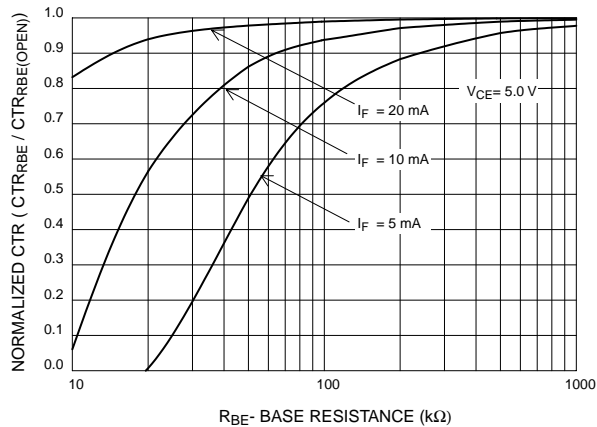
**Fig. 3 Normalized CTR vs. Ambient Temperature (Black Package)**



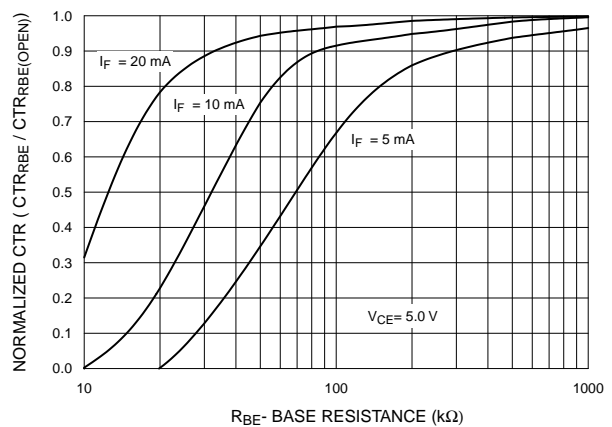
**Fig. 4 Normalized CTR vs. Ambient Temperature (White Package)**



**Fig. 5 CTR vs. RBE (Unsatrated) (Black Package)**

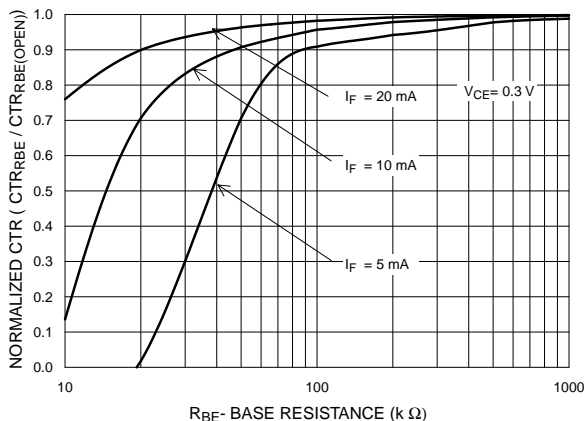


**Fig. 6 CTR vs. RBE (Unsatrated) (White Package)**

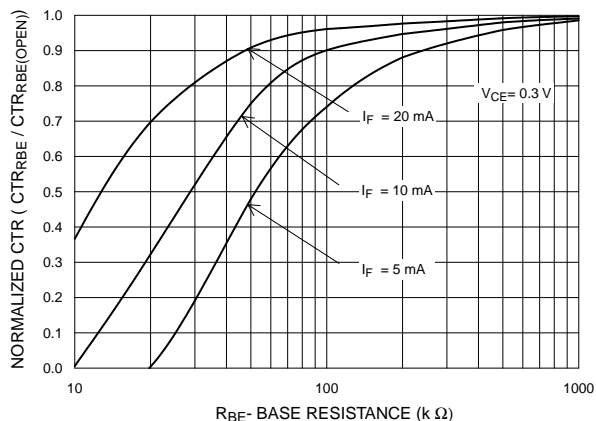


**CNY17-1 CNY17-3**  
**CNY17-2 CNY17-4**

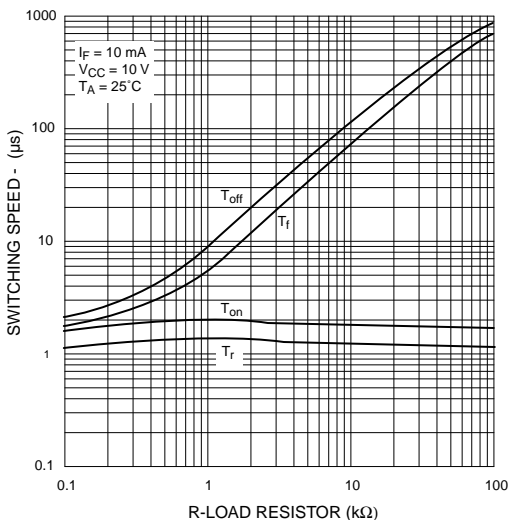
**Fig. 7 CTR vs. RBE (Saturated)**  
**(Black Package)**



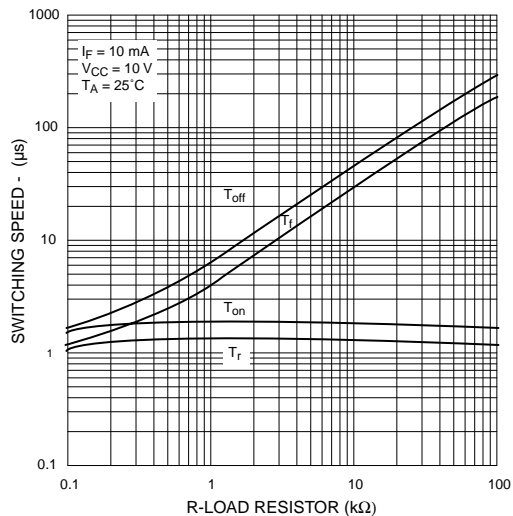
**Fig. 8 CTR vs. RBE (Saturated)**  
**(White Package)**



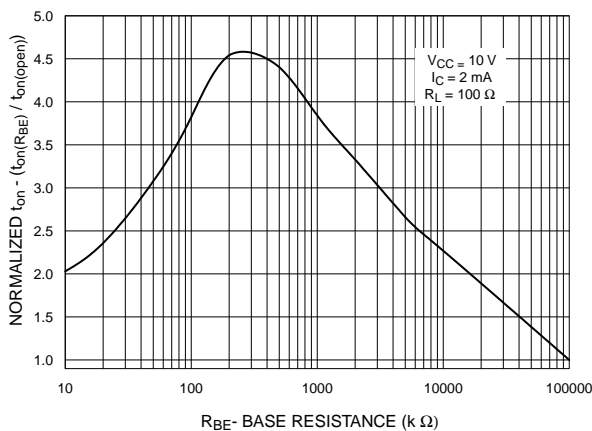
**Fig. 9 Switching Speed vs. Load Resistor**  
**(Black Package)**



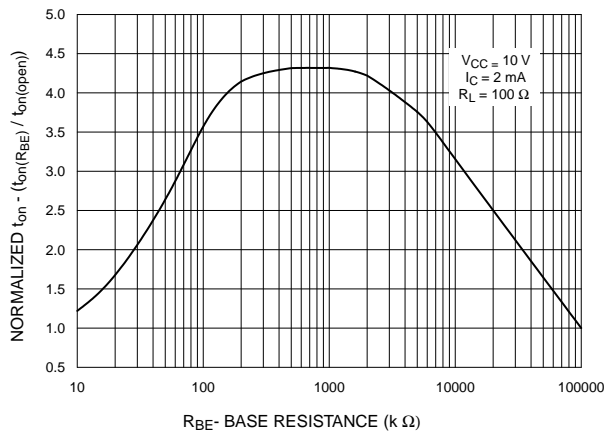
**Fig. 10 Switching Speed vs. Load Resistor**  
**(White Package)**



**Fig. 11 Normalized ton vs. RBE**  
**(Black Package)**

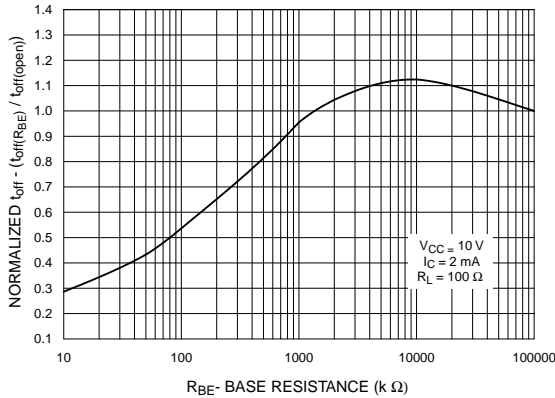


**Fig. 12 Normalized ton vs. RBE**  
**(White Package)**

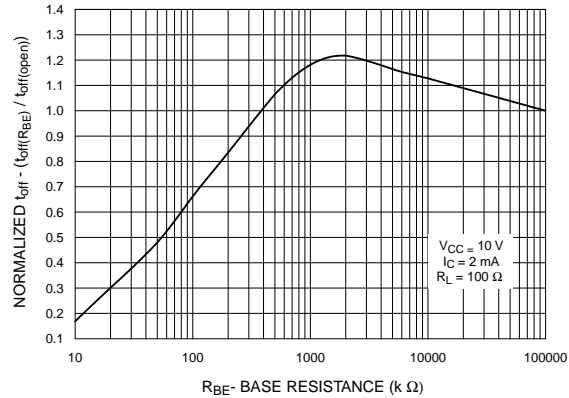


**CNY17-1 CNY17-3**  
**CNY17-2 CNY17-4**

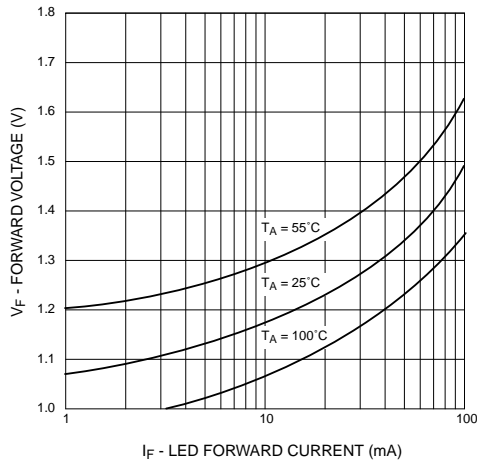
**Fig. 13 Normalized  $t_{off}$  vs.  $R_{BE}$  (Black Package)**



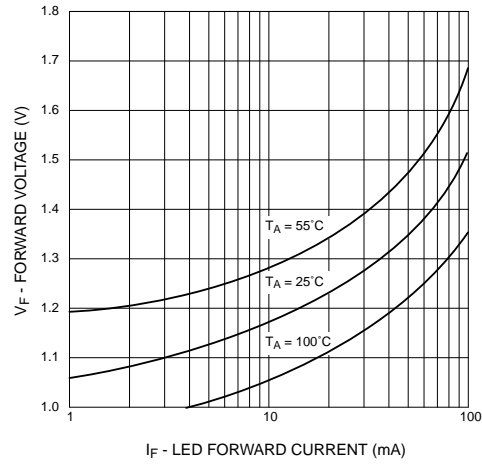
**Fig. 14 Normalized  $t_{off}$  vs.  $R_{BE}$  (White Package)**



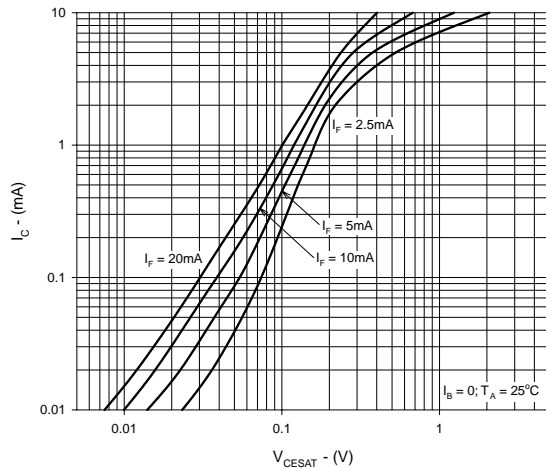
**Fig. 15 LED Forward Voltage vs. Forward Current (Black Package)**



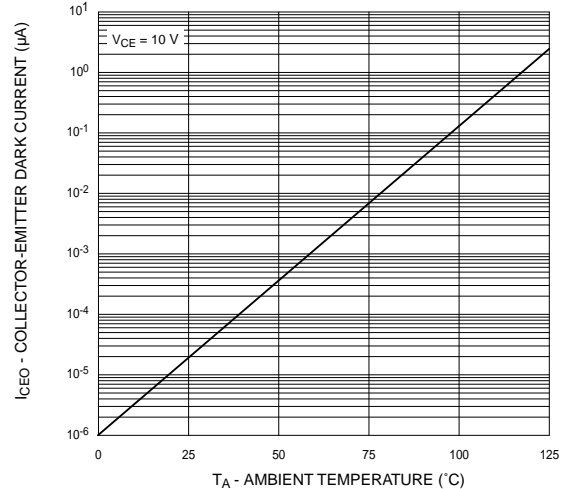
**Fig. 16 LED Forward Voltage vs. Forward Current (White Package)**



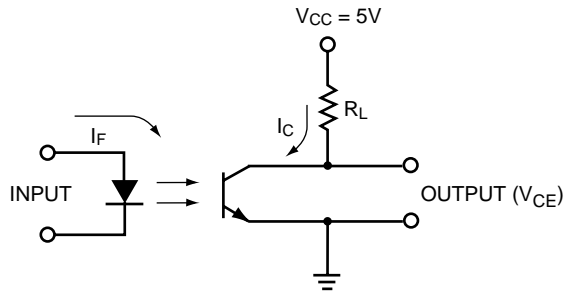
**Fig. 17 Collector Current vs. Collector-Emitter Saturation Voltage**



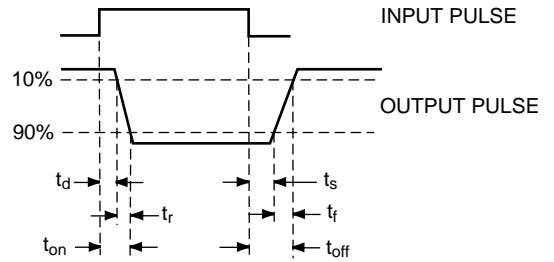
**Fig. 18 Dark Current vs. Ambient Temperature (Black Package)**



|         |         |
|---------|---------|
| CNY17-1 | CNY17-3 |
| CNY17-2 | CNY17-4 |



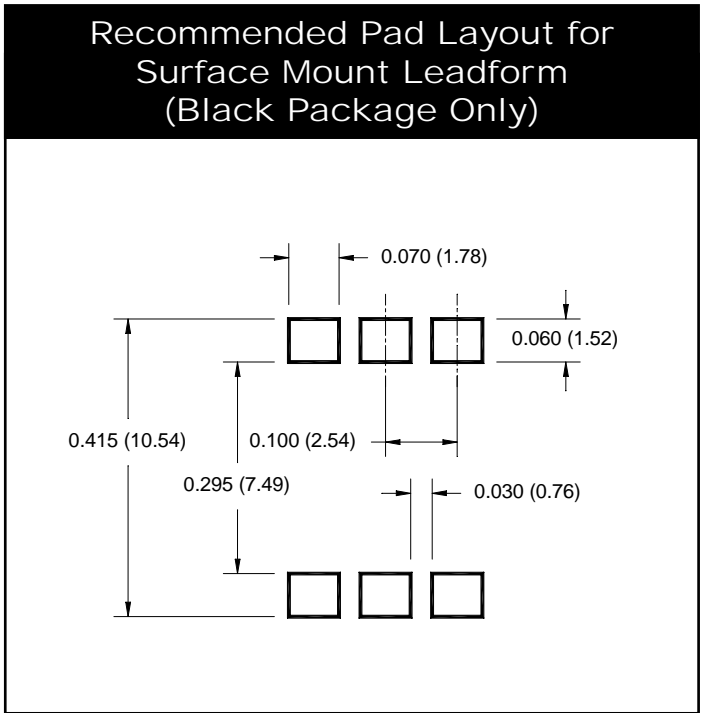
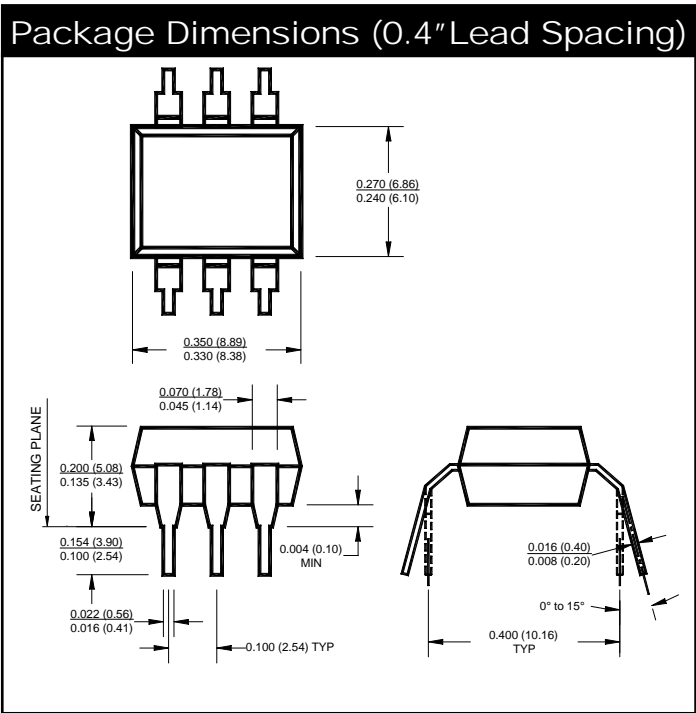
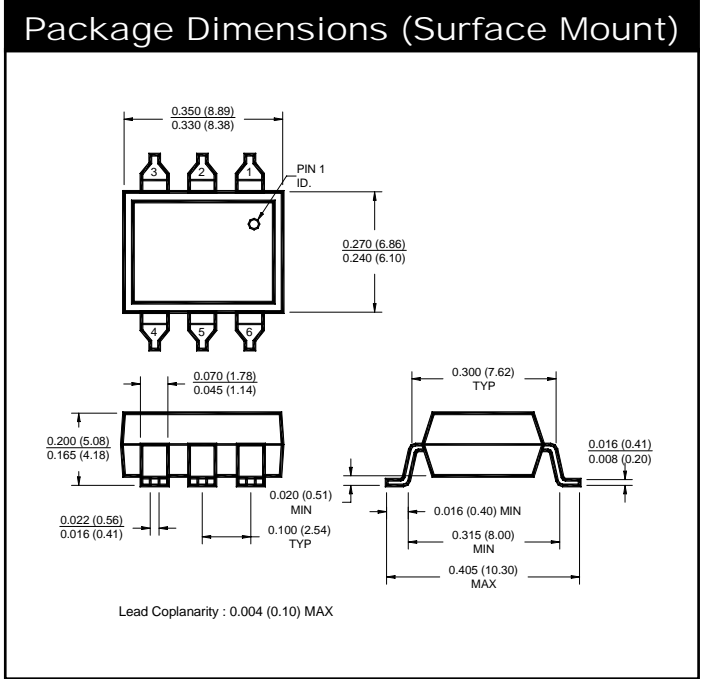
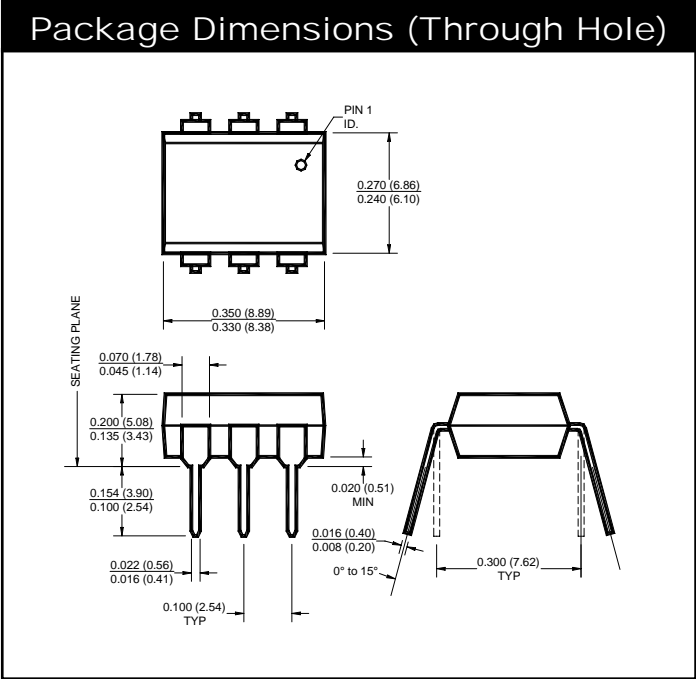
**Figure 19. Switching Time Test Circuit**



**Figure 20. Switching Time Waveforms**

Black Package (No -M Suffix)

|                |                |
|----------------|----------------|
| <b>CNY17-1</b> | <b>CNY17-3</b> |
| <b>CNY17-2</b> | <b>CNY17-4</b> |



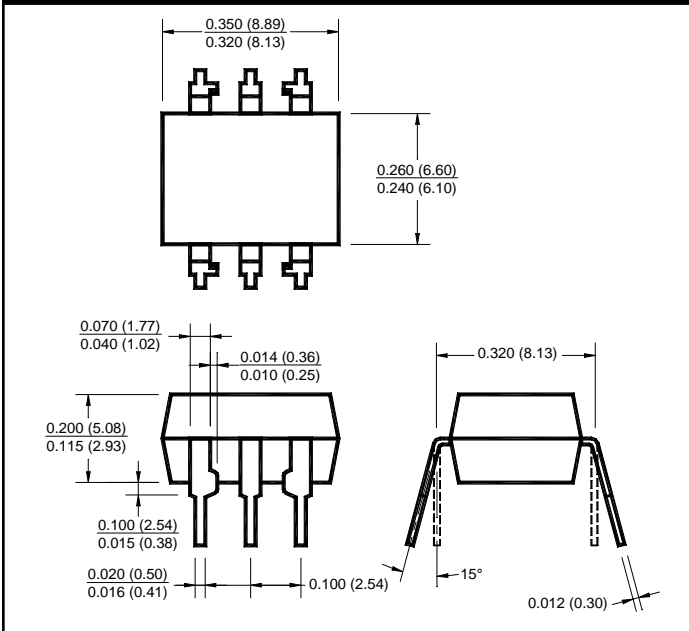
**NOTE**  
All dimensions are in inches (millimeters)



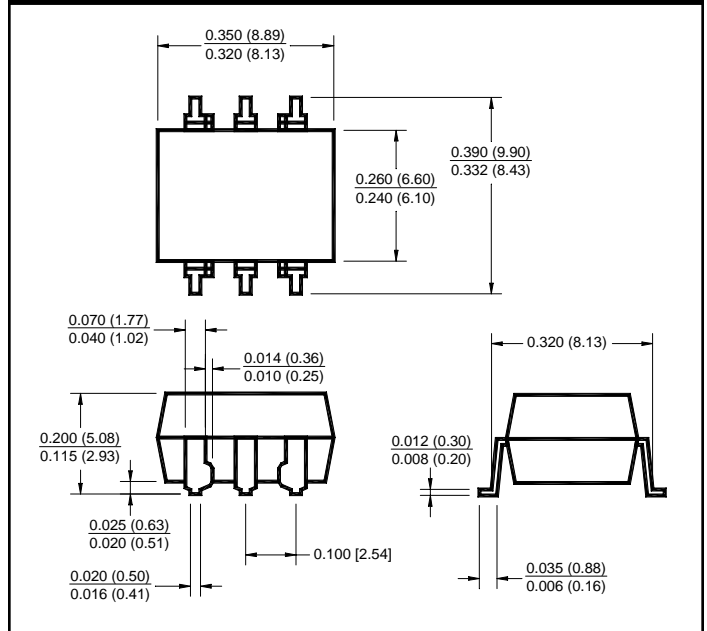
White Package (-M Suffix)

|         |         |
|---------|---------|
| CNY17-1 | CNY17-3 |
| CNY17-2 | CNY17-4 |

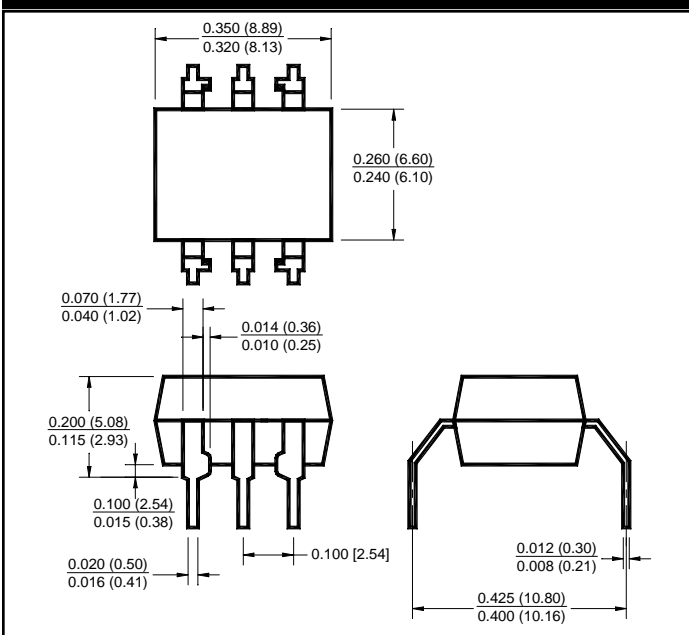
Package Dimensions (Through Hole)



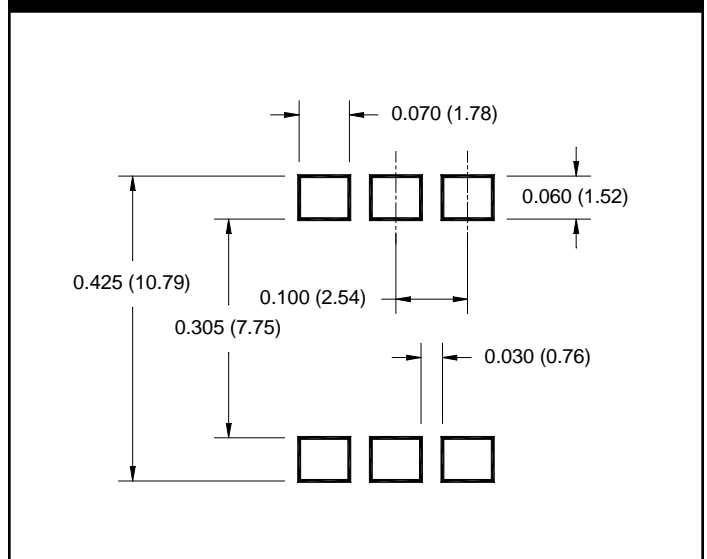
Package Dimensions (Surface Mount)



Package Dimensions (0.4" Lead Spacing)



Recommended Pad Layout for Surface Mount Leadform (White Package Only)



**NOTE**

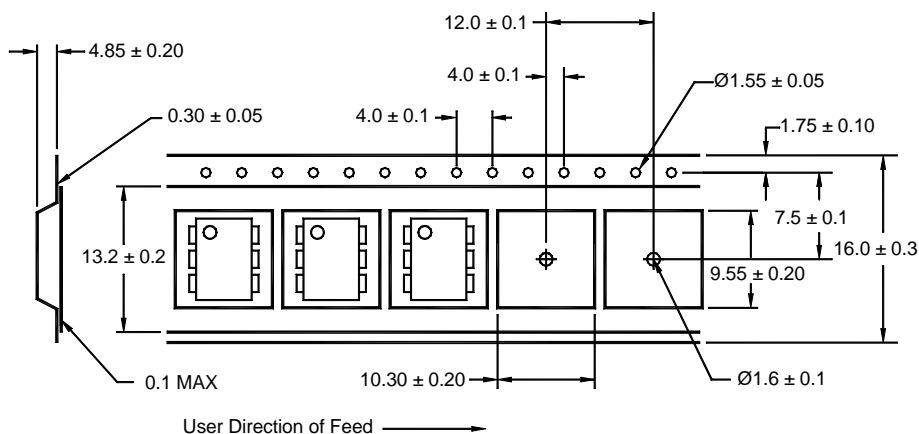
All dimensions are in inches (millimeters)

**CNY17-1 CNY17-3**  
**CNY17-2 CNY17-4**

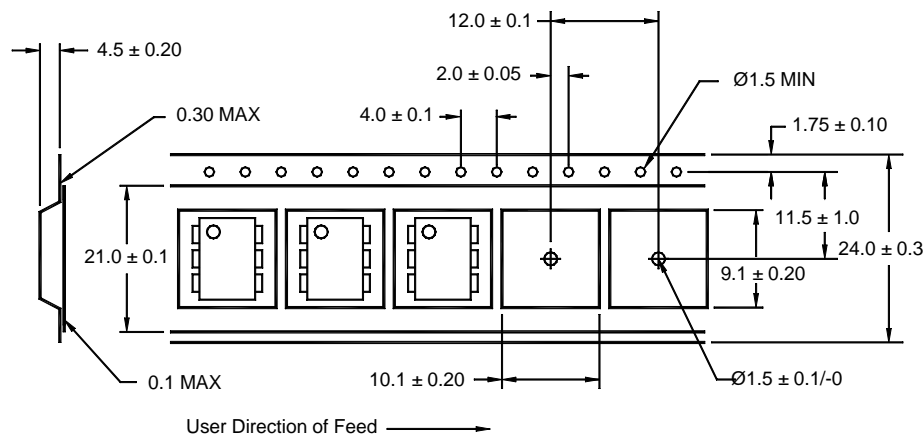
**ORDERING INFORMATION**

| Option                        | Black Package<br>(No Suffix) | White Package<br>(-m Suffix) | Description                          |
|-------------------------------|------------------------------|------------------------------|--------------------------------------|
| <b>Order Entry Identifier</b> |                              |                              |                                      |
| S                             | .S                           | S                            | Surface Mount Lead Bend              |
| SD                            | .SD                          | SR2                          | Surface Mount; Tape and reel         |
| W                             | .W                           | T                            | 0.4" Lead Spacing                    |
| 300                           | .300                         | V                            | VDE 0884                             |
| 300W                          | .300W                        | TV                           | VDE 0884, 0.4" Lead Spacing          |
| 3S                            | .3S                          | SV                           | VDE 0884, Surface Mount              |
| 3SD                           | .3SD                         | SR2V                         | VDE 0884, Surface Mount, Tape & Reel |

**Carrier Tape Specifications (Black Package, No Suffix)**



**Carrier Tape Specifications (White Package, -M Suffix)**



**NOTE**

All dimensions are in inches (millimeters)

|         |         |
|---------|---------|
| CNY17-1 | CNY17-3 |
| CNY17-2 | CNY17-4 |

## DISCLAIMER

FAIRCHILD SEMICONDUCTOR RESERVES THE THE RIGHT TO MAKE CHANGES WITHOUT FURTHER NOTICE TO ANY PRODUCTS HEREIN TO IMPROVE RELIABILITY, FUNCTION OR DESIGN. FAIRCHILD DOES NOT ASSUME ANY LIABILITY ARISING OUT OF THE APPLICATION OR USE OF ANY PRODUCT OR CIRCUIT DESCRIBED HEREIN; NEITHER DOES IT CONVEY ANY LICENSE UNDER ITS PATENT RIGHTS, NOR THE RIGHTS OF OTHERS.

## LIFE SUPPORT POLICY

FAIRCHILD'S PRODUCTS ARE NOT AUTHORIZED FOR USE AS CRITICAL COMPONENTS IN LIFE SUPPORT DEVICES OR SYSTEMS WITHOUT THE EXPRESS WRITTEN APPROVAL OF THE PRESIDENT OF FAIRCHILD SEMICONDUCTOR CORPORATION. As used herein:

1. Life support devices or systems are devices or systems which, (a) are intended for surgical implant into the body, or (b) support or sustain life, and (c) whose failure to perform when properly used in accordance with instructions for use provided in labeling, can be reasonably expected to result in a significant injury of the user.
2. A critical component in any component of a life support device or system whose failure to perform can be reasonably expected to cause the failure of the life support device or system, or to affect its safety or effectiveness.